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ABSTRACT

The Upside Down Tree Design (UDT) shows how teachers can use curriculum planning to improve academic standards. UDT employs the "design down" approach, where the design of the curriculum is arranged down from the general to the specific, but the delivery of the curriculum is presented up from specific to the general. The text explores the need for bringing a comprehensive-design process to clarify planned school curriculums and discusses ways to help teachers learn to achieve this clarity. It describes a model, Project McExtend, in which 130 teachers from 9 school districts, as well as college faculty, were recruited for an interdistrict curriculum writing project that addressed new state standards in math, science, and technology. Results show that teachers do not view themselves as curriculum developers; instead, they see their textbooks and state guides as the curriculum. Teachers expressed the desire for common specific skill training at their own grade level and for the technology to implement the UDT design. One problem was that before they could master the design-down process, they had to unlearn previously learned design-up constructs. (Contains 12 references, 6 tables, and 3 figures.) (RJM)

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Designing Curriculum That Responds to the Recent Agenda For Change

Teachers Try The Upside Down Tree

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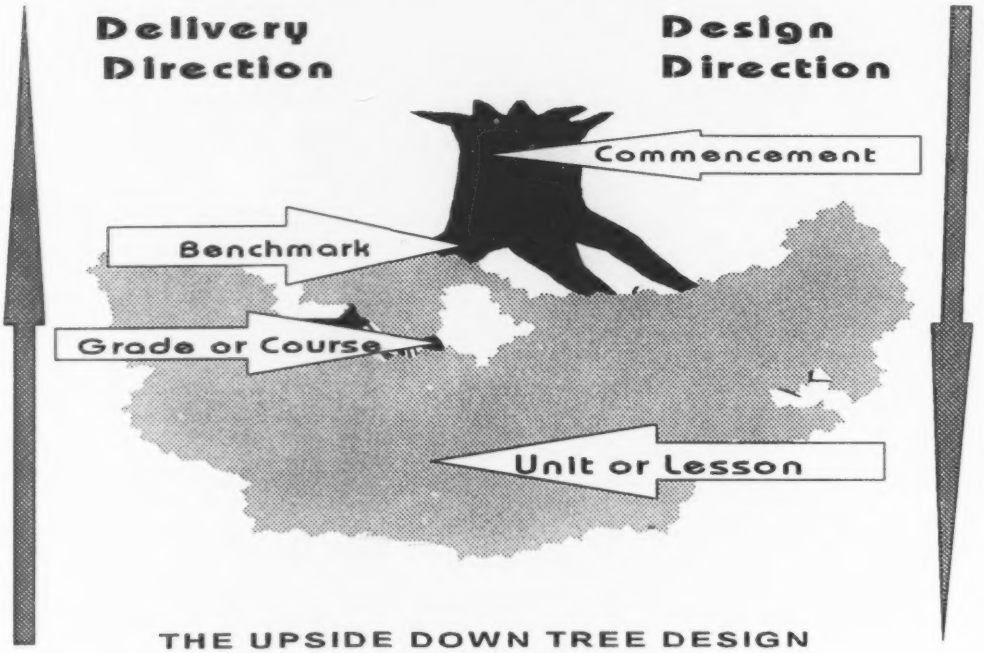

THE UPSIDE DOWN TREE DESIGN

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American Educational Research Association-- San Diego, CA 1998

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Designing Curriculum That Responds to the Recent Agenda For Change
Teachers Try The Upside Down Tree

The Standards Agenda

Evidence for the remarkable political power of the concept of higher standards is clearly embedded in current national calls for action on raising education standards at both the state and federal levels. President Clinton's 1997 state of the union message to Congress spent most of the time on his education agenda, and many governors followed suit as they addressed their legislatures. These followed the leadership of the business community, which along with government representatives emerged from the 1996 National Summit meeting with an agenda for raising and equalizing standards across the country and for infusing technology into them.

This agenda was based on juxtaposed concerns about this country's economic health and reports of disappointing performances of our students on international competency tests. Although the test results seem valid, the recommendations for ameliorating the problem are grounded in several as yet unproven assumptions and beliefs about education in the United States including: the belief that the future of this country's economic health depends on the improvement of student achievement, the belief that clearly stated and uniform standards and technologically rich instruction will alone result in higher student achievement in this country when it is compared to student achievement on an international basis, and the belief that high stakes measures will guarantee the implementation of the standards (Natriello, 1996; McClaslin, 1996).

As they have already been developed by some individual states and professional organizations such as the National Council of Teachers of Mathematics and the New Standards program (a coalition of the Learning and Research Development Center and the National Center on Education and the Economy), standards are essentially outcomes or receiver-based objectives that

may or may not have attached performance measures. They retain the "design down" potential of outcome-based instruction but **differ in their intent from goals and objectives in that they are prescriptions designed for the purpose of higher expectations and uniformity**. In many respects the standards parallel traditional goals and objectives as well as outcomes. But they have been more specifically organized (by McRel (1993) and others) into "content standards," "performance standards," and variably into "curriculum" or "opportunity to learn standards." For the National Summit Conference in the spring of 1996 Borthwick, & Nolan (1996, p1) defined the terms as follows: **Content standards** "provide guidance for the design of instructional programs" and "a tool for checking the quality .....in terms of coverage of expected knowledge and skills," but are limited in their ability to improve student achievement because they, "do not tackle the crucial question of performance." Aligned performance measures are therefore necessary. These, which contain specific performance indicators and performance tasks, more clearly describe "how good is good enough" and are termed **"performance standards"** (McRel, 1993; Council for Basic Education, 1996). Table I compares the traditional and new terms.

Curriculum Enactment

Curriculum, in its current interpretation, implies the total school experience. Content standards represent a kind of planned vision for the desired results of the curriculum and performance standards a design for measuring these results. Neither of these address the many other variables that affect what happens in schools: the day to day variations in students, teachers and the classroom environment that more closely frame the "enacted curriculum" (Ball & Cohen, 1996). They are a destination without a road map. And in Weinstein's (1996, p16) words, "Simply willing higher expectations without attention to effective teaching practices will not result in higher

achievement." The enacted curriculum is what ultimately affects student achievement and it requires the equal attention of standards.

TABLE I
COMPARING TRADITIONAL GOALS AND OBJECTIVES WITH STANDARDS

Goals and Objectives	Standards
☛**Overall Goals** are general statements of the broader intents of the educational process. They may be stated for large groups of students at varying levels or for smaller groups at specific levels. They usually are neither specific nor suggest any action or measures.	☛**Commencement level standards** resemble goals in their generality but describe the individual's capability at a specific terminal education point such as high school graduation. They may or may not have attached performance measures.
☛**Objectives** are designed down from **goals.** Objectives may focus on the giver or the receiver. On the giver: *To prepare students to be good citizens.* On the receiver: (behavioral objective) *Students will be able to make decisions that are good for society.*	☛ **Benchmark level standards** are designed down from **exit or commencement level standards**. **Grade level or course standards or outcomes** are designed down from benchmark standards. Standards focus on the receiver--although the receiver may be a group such as a school. *Students will become good citizens.* *Students will be able to make decisions that are good for society.* *The school will prepare students for the technological future.*
☛Goals and objectives may be described in terms of a description of self, or in terms of conceptual or procedural knowledge. **Conceptual knowledge** objectives answer the question: "What should students know?" For example: *Students will know that selective burning is an effective measure for controlling forest fires.* **Procedural knowledge** objectives answer the question: "What should students be able to do?" *Students will be able to prevent forest fires*	☛Standards may be described in terms of a description of self, or in terms of conceptual or procedural knowledge. . **Conceptual knowledge** standards answer the question: "What should students know?" For example: *Students will know that selective burning is an effective measure for controlling forest fires.* **Procedural knowledge** standards answer the question: "What should students be able to do?" *Students will be able to prevent forest fires*. Conceptual and procedural knowledge standards that do not have specific performance measures (such as those below) are **content standards.**
☛**Behavioral objectives** may or may no t have a level of performance stated; if they do they are performance-based. *Students will be able to choose environmentally sound actions from a list with 80% accuracy.*	☛If standards do have specific performance indicators and performance tasks, they are **performance standards**. *Given a written problem situation, students will be able to describe three measures that prevent forest fires.*
☛ **Goals and Objectives are planning guides.**	☛ **Standards are prescriptions for creating uniformity.**

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Although standards attached to the variables of the enacted curriculum have been defined as "curriculum standards"or "opportunity to learn standards" (McRel, 1993; Council for Basic Education, 1996), this may be confusing terminology. The term curriculum in its modern interpretation is broad and includes all of the facets of instructional delivery." "Opportunity to learn" has socially positive implications but I believe that the term "*enabling*" standards may be a better choice. This borrows from the historical use of the term "enabling objectives," which referred to the activities that supported the desired goals and objectives. I believe that when the enabling standards refer to the specifics of the discourse and actions that the student is engaged in they may be called *enabling activities.*

A general standard such as: "Students will be good problem solvers" can be met at many different levels and in the context of different content areas. Like the trunk of a tree, the general standards support a widely reaching set of branches and leaves. But just as the leaves in turn must manufacture food and nurture the trunk, the more specific "designed down" content standards must feed into the general ones--they make the general ones happen. None of this works if the connections of internal flow are impeded. The junctures where twigs meet branches and branches meet trunks are particularly important. The design of curriculum may be *down* from the general to the specific, but the delivery of the curriculum is *up* from specific to the general, the broader generalization or concept. The outcome of each lesson is fed through a twig to the branch that is the unit and then into a larger one that is the grade level. Several grade levels may feed into a larger branch at a benchmark juncture and this, in turn, finally meets the main trunk. Table II shows the design down process and Figure 1 illustrates the *upside down tree* (UDT) design

FIGURE 1

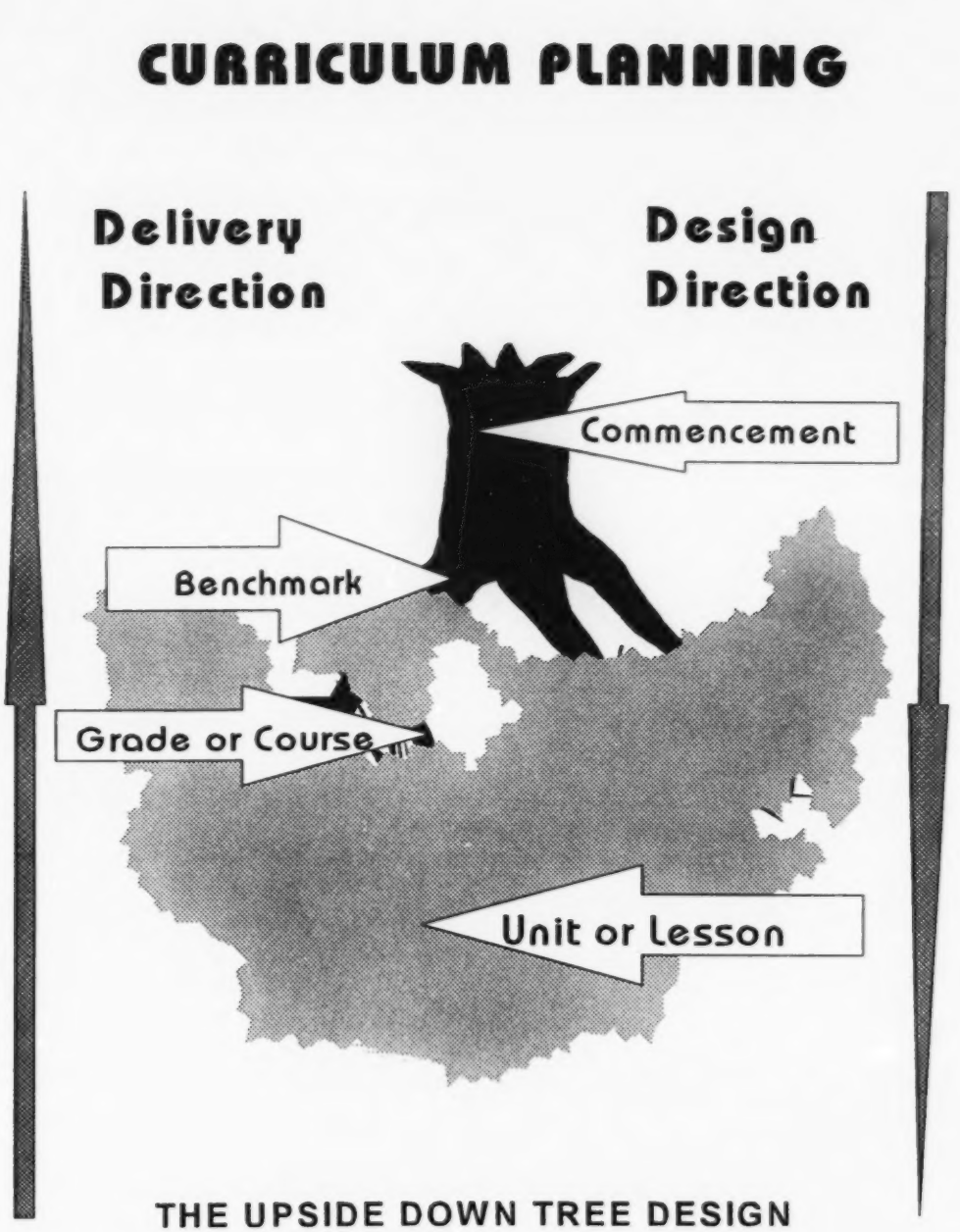
CURRICULUM PLANNING
Delivery Direction
Design Direction
Commencement
Benchmark
Grade or Course
Unit or Lesson
THE UPSIDE DOWN TREE DESIGN

TABLE II- "DESIGNING DOWN"
FROM COMMENCEMENT STANDARDS TO BENCHMARKS AND COURSES
SOME VERTICAL ARTICULATION EXAMPLES

COMMENCEMENT CONTENT STANDARD:
Students Will Be Good Problem Solvers.

- **Benchmark Level 1 (Sixth grade): Content standard**.
Students will understand and apply skills related to gathering, evaluating, interpreting and presenting information.

  Fourth grade **content standard**. *Students will know how to make a bar graph from data.*
  Matching fourth grade **performance standard:** *Students will correctly record a set of temperature data and translate it to a bar graph*

- **Benchmark Level 2 (Tenth grade) : Content standard.**
Students will use formal and informal reasoning processes in applying problem solving, decision making and negotiating techniques.

  Algebra course **content standard**: *Students will know how logarithms are related to our base ten number system.*
  Matching algebra course **performance standard**: Students will explain how a logarithm is determined and apply this to the structure and derivation of a table of logarithms.

COMMENCEMENT CONTENT STANDARD:
Students Will Be Good Communicators

- **Benchmark Level 1(Sixth grade): Content standard.**
Students will be able to communicate their thoughts and ideas in written form.

  Fourth grade **content standard**: *Students will know that a good topic sentence provides focus for a paragraph.*
  Matching fourth grade **performance standard**: *Students will write a book report that has topic sentences which provide four paragraphs with good focus.*

- **Benchmark Level 2 (Tenth grade): Content standard.**
Students will understand the forms, techniques, and stylistic requirements of a variety of written communications.

  Ninth grade **content standard**: *Students will be able to write a persuasive essay.*
  Matching ninth grade **performance standard**: *Students will write a persuasive essay that clearly delineates a point of view and provides at least three reasons to support it.*

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At the same time, there must be horizontal articulation. As the leaves turn toward the sun, the carbon dioxide must enter them. The performance standards must match the content standards and measure the achievement. When based on carefully reviewed previous experience, the settings and activities of well planned enabling standards can have a reasonable probability for helping the student be successful in these measures. They should encompass a wider scope of the variables of the classroom experience: the teachers' knowledge, the discourse, the materials (including technological), the allocation of time and space, the social contexts of peers and adults. Attention to a comprehensive design process can bring some needed coherence and clarity to planned school curriculums. Although, the achievement of greater equity in the enacted curriculum for all students is a far greater challenge, as we note ahead, the process of curriculum design is in itself only the first step. As part of our plan for helping teachers learn how to do this we explored what kinds of enabling activities were most useful. How effective was structured large group instruction when compared with interactive small groups actually working on curriculum? Table III shows the horizontal articulation.

TABLE III- HORIZONTAL ARTICULATION EXAMPLES OF STANDARDS		
CONTENT STANDARDS	**PERFORMANCE STANDARDS**	**ENABLING STANDARDS**
At grade 1 students will know that: addition is an increase on the number line, subtraction is a decrease in the number line, and that there are also symbols(+)and (-) for the operations. **At grade 2** students will know that: addition (+) is a combining of parts to form a whole, and that subtraction (-) is a separation from the whole; that the parts and whole can be represented by number symbols representing the real amounts (referents). Students will have achieved the cardinal principle (see quantities as units) and not have to count all.	**At grade 1** students will be able to provide the correct new number by counting on a number line, when solving change/result unknown addition problems that simulate their own prior or present experience. **At grade 2** students will compute the correct new number by counting on (adding) from the first number or counting down (subtracting) from the first number, in change/result unknown problems, combine problems, and part unknown problems based on their own present or prior experience. Students will identify the unit parts and whole in canonical and non-canonical problem forms.	**Grade 1** teachers will understand the sequence of the way research has told us students learn to add and subtract: from the changes on a number line to counting on and down from the first number to the more complex choices and interpretations of non-canonical problems. **Grade 2** teachers will structure appropriate problems and dialogue, diagnose student misconceptions and use the necessary materials. Each **grade 2** student will have at least one uninterrupted hour for math each day; including some early morning time. Group problem solving with peer interaction will be integrated into every math lesson and supersede time spent on computation practice. Classrooms will be provided with interactive technology and manipulative materials such as unifix cubes and bead frames.

Applying the UDT Design Process: Project McExtend

Kirst (1995) proposes that even if the curriculum standards are in general form as most of the new state documents have been, they still can have an effect on practice by shaping attitudes about content and performance. Nevertheless, resistance to change is a historical pattern for educational systems and teachers (Solomon, 1995), and the production of more specific classroom enabling activities within the upside down tree (UDT) design that will help students meet the standards is not an easy task. Coherent policies and professional development programs for teachers will be needed to help them make the transition to the new standards and design process.

Kirst suggests that policymakers use a combination of *push* and *pull* factors to help implement new policies. Push factors include the mandated assessments and graduation requirements that we discussed in previous Chapters. Pull factors include incentives such as grants and demonstrations of effective practice. We used the pull factors of a Goals 2000 grant and demonstrations of effective use of technology by classroom teachers in our McExtend Network 1997-1998 staff development program.

As the first phase in an attempt to apply new standards and design ideas, 130 teachers from nine different school districts and College faculty were recruited for an inter-district curriculum writing endeavor that addressed new state standards in math, science and technology. We initiated the task by bringing all participants together for four summer days to prepare them to write the curriculum that they would then use and share with others. There were three major elements in our agenda for the summer.

- Teachers had to become familiar with the new standards. In their attempt to simplify the presentation, the state documents were not consistently written in new standards terminology and the presentation form was confusing. It was difficult for teachers to determine what was expected for their particular grade level and what was a content or performance standard.

- The second element on our agenda was to demonstrate how new technology could be infused into the curriculum. We used a variety of venues for this purpose, trying to expose everyone to the most current and promising applications. As reported below, for some, this may have been a mistake.
- The third element was to enable the teacher curriculum-writers to use the UDT design.

The participants represented all grade levels and the College faculty. The four day program took them through a rotating schedule of technology and curriculum writing components. The instructional staff consisted of a combination of technologically expert teachers, curriculum-oriented school administrators, and college faculty. The staff had agreed to use the UDT design concepts and the parameters were discussed in several preparatory meetings.

On the first day, participants were given background materials that included excerpts from a book that described the UDT process and previously produced exemplars of applications of the state standards. They were also given a set of content standards for the professional development program in curriculum construction in which they were engaged. These later became the basis for the assessment design in this study. After a half-day introduction and "hands-on" demonstration of the focus of the new standards, an emphasis on inquiry, reasoning and processes, they circulated for the next seven half-days among nine different venues. These included sessions at IBM, Lamont Doherty Geological Observatory, and newly installed "Smart Technology Labs" at local schools.

The four days were followed by another four days spread out over the rest of the summer and fall in which the participants got together in small related subject and grade level (and College) groups and wrote curriculum. The groups were monitored and supported by a five person leadership team of curriculum specialists.

Program Assessment and Research Purposes

Traditional professional development components or interventions, whether conducted within school districts by district personnel or external consultants, or at universities by professors, are not usually long term programs with summative assessments of impact on practice. Assessments, especially those conducted by outsiders, are applied only immediately after delivery. They may have construct assessment components (tests) to discover whether or not a particular conceptual outcome has been achieved (**short term knowledge gained**), but more often than not they are merely self-assessments by the participants. Rarely, is there a follow-up to measure the results of the professional development (***long term knowledge gained)*** and even more rarely is there a measure of ***level of performance demonstrated***.

There are so many variables which affect implementation that direct cause and effect connections are difficult. Self-assessments are the most practical and for previous programs we had asked the participants themselves for evidence of long term implementation of newly acquired skills.

In this case we did have the opportunity to gather some additional evidence of the effects of our intervention. We were interested in the answers to several questions.

- How effective were the four days of formal summer instruction as preparation for experienced teachers to write curriculum that would implement new state standards?
- Were the four days enough to encourage them to add technology to their curriculum?
- What would be the longer term effects of this formal component?
- Would there be a relationship between the short and long term self-assessments?
- Would the follow-up working group meetings with teachers from other districts support the process?

- Would there be a connection between their self-assessments and the quality of the curriculum they produced? achieved (short term **knowledge gained**), but more often than not they are merely self-assessments by the participants. Rarely, is there a follow-up to measure the results of the professional development (**long term knowledge gained** ***)*** and even more rarely is there a measure of (***level of performance demonstrated***).

Program Assessment Design: Quantitative

After the four day instructional period participants completed interim individual and small group evaluations that were based on the content standards shared on the first day. The content standards OR desired outcomes for the four day preparatory period are shown in the Table IV below. Data collected was both quantitative and qualitative. Quantitative data consisted of:

- (A) A self-assessment of ***short term knowledge gained*** after the initial four days of formal instruction. This was principally to determine preliminary knowledge of the new standards and the terminology and therefore partial achievement of program outcomes as a result of the formal direct instructional component. The instrument was a translation of the 13 desired outcomes or content standards in Table IV to self-assessed performance standards via a five point scale from strong agreement with the standard achievement to strong disagreement with its achievement. It also had some open ended questions.
- (B) Another self-assessment of **long term knowledge gained** was employed at follow-up meetings with program staff and building principals after the working group meetings and curriculum writing were completed. These meetings were held at the home schools and were a search for evidence of implementation of the knowledge gained--or performance demonstrated as a result of engagement with the working groups and completion and implementation of the "hands on" task of writing and engaging self-constructed curriculum The instrument repeated some of the questions from the first instrument, but added several that related to the interactive working groups and the implementation of the curriculum. These are shown in Table V.
- (C) Six elements embodying the design of the final curriculum products (written documents) and based on the same criteria as the self-assessments were also evaluated by two independent raters. They used a task-specific design rubric to determine ***level of performance demonstrated.***

Each of the six elements (A-E) was rated on a four point scale. The total possible maximum score was 24.

TABLE IV: KNOWLEDGE GAINED
ASSESSMENT OF STATED STANDARDS OR OUTCOMES

At the opening of this preparatory workshop, I shared some of the content standards or outcomes the leadership team had decided upon. The instrument below translates the content standards into performance standards and measures their achievement.

The performance standard in each case is that the outcome or content standard listed is known well enough to define it and give an example. Many of the activities and the reading that you did this week should have prepared you to do this. The task before us, however, is a creative one that requires us to be above standard. We may not yet have reached this level, but our progress needs to be assessed.

The rubric is as follows:

- **Level 1. Can not define or give an example**
- **Level 2. Can define or give an example, but not both.**
- **Level 3. Standard: Can give an example and define.**
- **Level 4. Can create original curriculum which addresses and integrates this knowledge.**

TABLE IV-- CONTINUED
ASSESSMENT OF STATED STANDARDS OR OUTCOMES

For each outcome check the level achieved:

The current terminology for curriculum design including the meaning of content standard, performance standard, and enabling activity	1	2	3	4
How a particular benchmark in the New York State MST standards may lead to the commencement standard.				
How to trace or "design down" from commencement standards, through benchmark standards and thence to grade and unit standards or outcomes.				
How to choose or construct grade level or unit standards or outcomes that will lead to the achievement of a particular chosen benchmark standard.				
How to match the standards with enabling activities that have the greatest potential of achieving these standards and outcomes				
Understand the difference between technology as a learning tool and technology as a content area.				
Understand the technology expectations of the MST standards and know how to match them with appropriate enabling activities				
Know how to set the stage and plan the dialogue for technologically-based enabling activities in terms of grouping of students, use of time, space, and the props of computers and other technologies (e.g., probes, wind tunnels).				
Know how to use applications that provide simulation activities.				
Know how to use applications that provide data recording, manipulation and interpretation (especially graphing) opportunities				
Know how to use applications that connect computer technology to other technological data recording and variable adjusting interfaces				
Know how to use applications that enable students to use multimedia in the implementation of activities and assessment tasks that match the MST standards				
Know how to use applications that will provide teachers and their students access to the resources of the Internet and local networks.				

TABLE V
LONG TERM CHANGE IN KNOWLEDGE AND ATTITUDE

We are interested in any changes in your teaching skills and attitudes that may have occurred as a result of participation in last summer's McExtend program. Please check each of the items below to indicate the degree of this change as follows:

Greatly increased
Considerably increased
Some change
Very little change
No change at all

	A	B	C	D	E
Feeling comfortable using technology with my students					
Feeling comfortable using technology in my planning					
Having a repertoire of technological tools from which to choose					
Knowing more about the possible resources for helping me to incorporate technology					
Knowing some limitations of technology					
Being motivated to try some new technologies					
Seeing technology as the solution to some of my teaching challenges					
Being open to making some necessary changes in my curriculum that incorporate technology					
Looking forward to trying the specific new ideas I encountered					
Being open to sharing some of these ideas with my colleagues					
Being familiar with the New York State Math, Science and Technology Standards					
Seeing the Standards as starting points for curriculum planning					
Viewing the Standards as sources for assessment					
Understanding the concept of *benchmark*					
Seeing increased value in performance assessment					

Have you implemented the curriculum you designed?
Did you find the cross-district work groups helpful?
Have you maintained any contact with individuals you met during the summer?
What were the most valuable elements of last summer's program?

TABLE V: LEVEL OF PERFORMANCE DEMONSTRATED CURRICULUM ASSESSMENT SCORING RUBRIC

Level 1 : (Below Standard)	
A. State standards not clearly defined as content standards and performance standards.	
B. Designed down unit standards not appropriately articulated with state commencement and benchmark standards.	
C. Unit enabling activities not articulated well enough to accomplish standards .	
D. Performance measures not articulated well enough to adequately measure standards.	
E. Enabling activities not clearly enough outlined for others to follow. Little originality.	
F. Technology not applied	
Level 2: (Approaching Standard)	
A. State standards clearly defined as content standards and performance standards	
B. Some designed down unit standards not appropriately articulated with state commencement and benchmark standards.	
C. Some unit enabling activities not articulated well enough to accomplish standards	
D. Performance measures not articulated well enough to adequately measure standards	
E. Some activities not clearly enough outlined for others to follow. Some originality.	
G. Technology not adequately employed	
Level 3: (At Standard)	
A. State standards clearly defined as content standards and performance standards	
B. Designed down unit standards appropriately articulated with state commencement and benchmark standards.	
C. Unit enabling activities articulated to accomplish standards	
D. Performance measures adequately measure standards	
E. Activities clearly outlined for others to follow. Activities are original or appropriate adaptations.	
F. Technology employed	
Level 4: (Above Standard)	
A. State standards clearly defined as content standards and performance standards	
B. Designed down unit standards articulated with state commencement standards and show clear and appropriate developmental levels toward reaching them.	
C. Unit enabling activities articulated to accomplish standards and inspire students to go beyond the standards	
D. Performance measures designed to diagnose deficiencies in standards achievement and direct students and teachers toward remediation measures.	
E. Activities clearly outlined, creative and inspiring for others to follow.	

Program Assessment Design: Qualitative

Qualitative data was collected by team leaders at working group meetings during the late summer and fall . Each team leader contributed qualitative data on the curriculum writing process as it was enacted. . Additional qualitative data were collected at the follow-up home school meetings conducted during the following spring. Collation of qualitative data occurred in summarizing leadership team meetings.

Quantitative Data Analysis

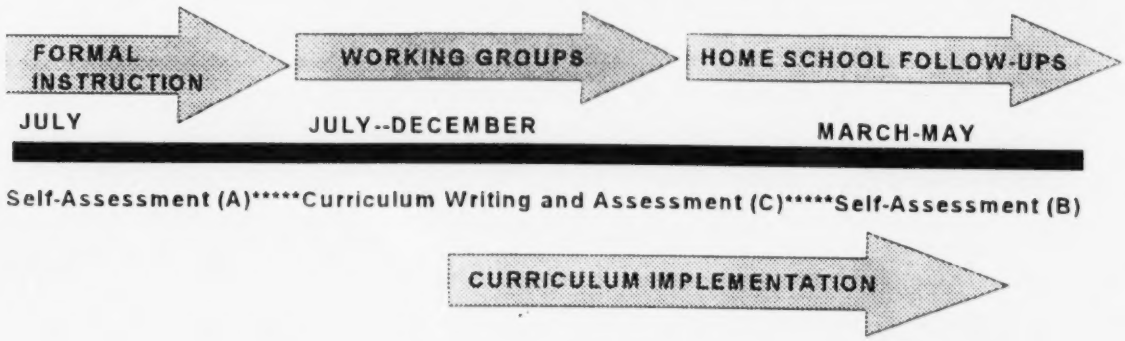
Quantitative analyses were descriptive and inferential. Descriptive data included:

- Mean and variability scores on the two self-assessment instruments [the post-formal component assessment of *short term knowledge gained* (1) and the follow-up long term changes in knowledge and attitude (2) measures].
- Mean and variability scores on curriculum products
- Team leaders also traditionally graded 44 of the participants (a little over one third who sought graduate credit). The traditional grades, with A-F values, were based on participant's performance with the working groups and their final curriculum product.

To determine the predictive value of the initial (post formal instruction component) self-assessment of *short term knowledge gained (A)*, correlation coefficients compared scores on the assessments completed after the first four days with the second follow-up self-assessment of *long term knowledge and attitude (B)*, and the *(C) level of performance demonstrated* scores of the curriculum product raters. The *long term change in knowledge and attitude* (B) self-assessment was also correlated with the level of performance (C) scores. The following time line indicates

the schedule.

The data collection is not complete at the time of this writing (we are still doing follow-up



interviews) and some participants chose to remain anonymous on one or another of the evaluations. The calculations below, therefore, are based on an N of 58 (although mean and standard deviations are available for the entire population of 130 on assessment A). T-tests comparing individual matched pairs of mean scores (A\B) and (A\C) to confirm or not confirm before and after differences were also run. :

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TABLE VI: QUANTITATIVE MEASURES		
MEASURE	SCORE	SCORE
Mean and standard deviation of (A). Maximum 4.0	2.79	.5034
Mean and standard deviation of (B) Maximum 5.0	3.43	.7268
Mean and standard deviation of (C) Maximum 24.0	19.46	3.43
Correlation Coefficient A\B & Level of significance	.23	NS
Correlation Coefficient A\C & Level of significance	.05	NS
Correlation Coefficient B\C & Level of significance	.36	.05
T-test A\B Level of significance		.001
T-test A\C Level of significance		.001
T-test B\C Level of significance		NS

Interpreting the table above, there was little relationship between the self-assessments done immediately after the formal instruction and that after 7 or 8 months of implementation A & B, and curriculum writing. Nor was there a relationship between the level of the quality of curriculum and the first assessment (A). T-tests showed that these were significantly different and there was no significant correlation. There was a significant correlation between the final self-assessment B and the level of the quality of curriculum and the T-test showed that they were not significantly different. Confronting the creative task of writing curriculum and implementing it may have changed the self-perceptions. Qualitative data collected in follow-up interviews may also indicate why perceptions changed.

Qualitative Data

Before discussing the results of our qualitative study it may be important to consider what some others have discovered about professional development. In an article on systemic reform Cohen (1995) identified the need for coherence in direction at all levels as a major problem. Corcoran and Goertz (1995) also found the current systems fragmented.

These needs were illustrated in our program. Everyone was confused by the terminology. of the state documents, which had been issued before the adoption of the nationally used terminology of content and performance standards. New documents combined the new terms with the old ones in unexplained ways. Many districts had recently written new curriculum using the outcome-based education terms and had different templates. Corcoran and Goertz identify inappropriate sequencing of implementation as a common problem. Some of the teacher-participants reported that central office and building administrators had different opinions on whether or not the new standards were worthwhile. In spite of efforts to coordinate, because of the limited time and numbers involved, the instruction and team leadership in our own program also varied.

Many researchers like those above have identified the professional development of teachers as the key to educational reform. They have also recognized that it will not be an easy task. Little (1993) explains that although traditional forms of delivery of professional development might work for the skill training components of reform, especially if transfer of knowledge from experts is followed up with opportunities to practice and is supported by coaching, presently called for reforms go beyond skills. They require that persons in local situations grapple with what broad principles look like in practice. We saw our participants

grapple. We also grappled.

During the working group meetings several concerns were noted:

- There was a large discrepancy between current knowledge and expectation.
- Many participants had no curriculum design experience.
- They were not familiar with the state standards documents and were unsure how to begin.
- Some had never seen state standards.
- There was a lack of clarity and coherence in organization and presentation of the documents themselves.
- The standards were very general and there was little congruence with current practice.
- There were no exemplars of how to make the connections between the very general standards and current curriculum.

In general, teachers do not seem to see themselves as curriculum developers. They see their textbooks and state guides as the curriculum. The teachers were unfamiliar with even traditional terminology of curriculum. For example, they could not identify characteristics of content versus process or content versus assessment.

We tried to help. In a follow up message to participants we provided exemplars which illustrated the design parameters. One sample was a fine unit on different kinds of graphs. It engaged the students in recording data and producing different graph forms through technology. What was missing from the stated content standards was a construct that would connect different forms of graphs with the different needs for graphing, or the rationale for choosing one graph over another.

In the follow-up conferences the participants expressed the desire for common specific

skill training at their own grade level. There was tension between the perceived varying needs of participants working at different levels and subject areas. They seemed unable to adapt to their own particular situation.

In spite of printed guides, text chapters, and templates on disks and careful preparation the design presentation may not have been coherent— even the presenters were novices. There was frustration with the fact that not all the school sites had the demonstrated technology. Among the participants there were disparate levels of prior knowledge of technology and curriculum. We may have tried to do too many new things at one time: curriculum design and technology. Before they could learn the new design-down process, they had to unlearn their previous design-up constructs. They had to reconstruct previous schemata. We created some disequilibrium-- perhaps too much for some.

Other complications revealed in the follow-up study were related to individual district agendas such as preparation for inclusion and new statewide assessments that created tension and distractions.

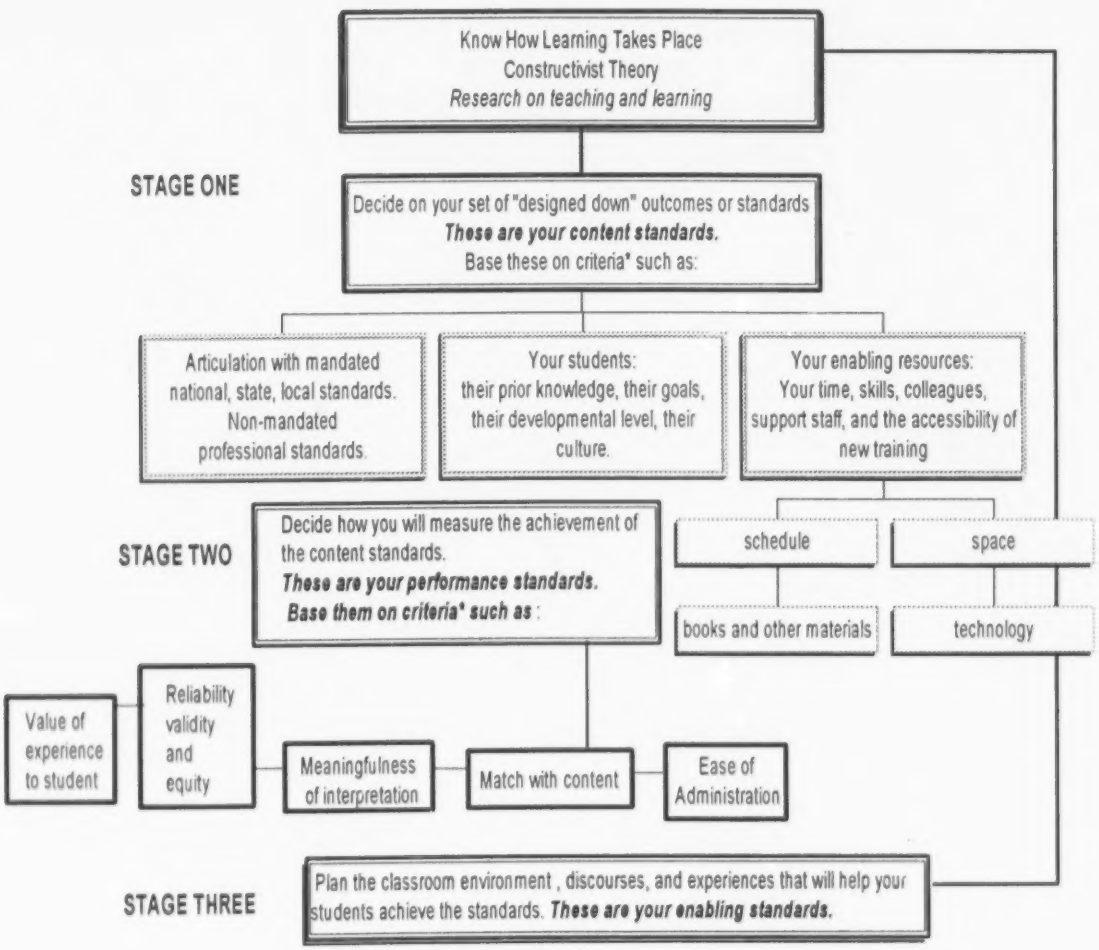
Conclusions and Recommendations

Professional development needs to employ the same approaches as classroom practice. When teachers are learners we need to take into account learning theory. Attention to our participants' prior knowledge would have helped. As teachers often do, we assumed knowledge of some content pieces that did not exist and discounted varying levels of existence for other content pieces. We also tried to do too much at once, overwhelming our audience. The developmental instructional mapping that works well in classrooms is needed in teacher

professional development as well. There was not enough time for guided practice before we left them on their own.

The analyses of the long term data in reference to the short term data reveal the need to extend the traditional form of professional development evaluation procedures to include longer term data collection. It is only over time and with practice that construction of challenging new knowledge can occur--especially if it means revision of old knowledge. These evaluations should also include the assessment of products produced as a result of interventions and performances demonstrated in the classroom.

Building a Standards Based Curriculum


Know How Learning Takes Place
Constructivist Theory
Research on teaching and learning
STAGE ONE
Decide on your set of "designed down" outcomes or standards
These are your content standards.
Base these on criteria* such as:
Articulation with mandated national, state, local standards. Non-mandated professional standards.
Your students: their prior knowledge, their goals, their developmental level, their culture.
Your enabling resources: Your time, skills, colleagues, support staff, and the accessibility of new training
STAGE TWO
Decide how you will measure the achievement of the content standards.
These are your performance standards.
Base them on criteria* such as :
schedule
space
books and other materials
technology
Value of experience to student
Reliability validity and equity
Meaningfulness of interpretation
Match with content
Ease of Administration
STAGE THREE
Plan the classroom environment , discourses, and experiences that will help your students achieve the standards. These are your enabling standards.

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